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Preparation of chakka whey beverage blended with watermelon (*Citrullus lanatus*) Juice

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Abstract

The present investigation entitled “Preparation of chakka whey beverage blended with watermelon (*Citrullus lanatus*) juice” was undertaken during the year 2019-2020. The chakka whey beverage was prepared with different combinations of chakka whey and watermelon juice viz. 100:00 (T1), 95:5 (T2), 90:10 (T3) and 85:15 (T4) with four treatments and five replications in completely randomized design (CRD). Sensory evaluation of chakka whey beverage was carried out for flavour, consistency, colour and appearance, mouthfeel and overall acceptability by 9 point hedonic scale. Chakka whey beverage prepared by blending with 10 parts of watermelon juice (T3) had secured the highest score 8.27, 8.21, 8.30, 8.38 and 8.38 for flavour, consistency, colour and appearance, mouthfeel and overall acceptability, respectively. The data observed that total solids, solid-not-fat, acidity, protein and ash percentage of chakka whey beverage were increased with increase in level of watermelon juice, while moisture, fat percentage and pH were decreased with the increase in level of watermelon juice. Chakka whey beverage prepared by blending with 10 parts of watermelon juice (T3) contained fat, total solids, SNF, acidity, protein, ash, moisture and pH were 0.41, 7.07, 6.66, 0.47, 0.49, 0.49, 92.93 per cent and 4.96 respectively. The chakka whey beverage prepared by blending with 10 parts watermelon juice level i.e. (T3) costing Rs. 22.30 per lit which was superiorly accepted by the panel of judges. Hence, it may be concluded that best quality chakka whey beverage can be prepared by using 10 parts of watermelon juice and 90 parts of chakka whey with 8% sugar.

Keywords: Chakaa whey, watermelon juice, sensory attributes, cost structure

Introduction

Whey is the watery part of milk that remains after separation of curd/coagulated product that result from acid or proteolytic enzyme mediated coagulation of milk. Whey is an important by-product obtained during the manufacture of cheese, chhana, chakka and paneer. Whey contains almost all constituent of milk except casein, fat and fat soluble vitamins. During flush season surplus quantities of milk is diverted in production of paneer, chhana, casein, and shrikhand, thus producing enormous quantities of whey as by product and usually disposed off causing major environmental pollution due to its high organic load. Proper disposal of whey is extremely important as it considered as a pollutant due to its high biochemical oxygen demand (40000-48000 mg/L) and chemical oxygen demand (80000-95000 mg/L) thus utilization of whey for the production of beverages, soft drinks and wines are contained almost all the nutrients of milk except casein and fat, thus making it highly nutritious. Whey present water, total solids, sugar (lactose), protein and fat were 93.5, 6.5, 4.9, 0.5 and 0.04 per cent respectively and almost all the water-soluble vitamins originally present in milk (Perasiriyana *et al.* 2013) [18].

Watermelon is consumed worldwide and is a potential source of bioactive compounds, such as citrulline and lycopene, which may display beneficial effects on human health (Choudhary *et al.* 2015) [4]. Lycopene is proven to be an effective oxygen radical scavenger as well as protective agent against heart diseases and various types of cancers (Perkins-veazie and Collins, 2003) [19]. Watermelon juice is an excellent source of vitamin A, C, chlorophyll, vitamin B1 and B6, potassium, iodine, magnesium, zinc and citrulline (Arteuro *et al.*, 2012) [2] but low in calories. Therefore present investigation has been carried out to study the sensory acceptability of beverage and also enhance the nutritional qualities of whey watermelon beverage to increase the deliciousness of the product.

Material and methods

Preparation of chakka whey beverage blended with watermelon (*Citrullus lanatus*) juice” was undertaken in the section of Animal Husbandry and Dairy Science, College of Agriculture Nagpur, during 2019-20. Watermelon juice was added in chakka whey beverage at different levels, i. e. 0 (T1), 5 (T2), 10 (T3) and 15 (T4) parts of chakka whey with five replications and

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sugar was added @ 8% of chakka whey beverage in all treatments. The fat, total solids, SNF, acidity, protein, ash, pH and moisture of chakka whey beverage were determined. The process flow chart for preparation of chakka whey beverage blended with watermelon juice is given in flow chart 1.

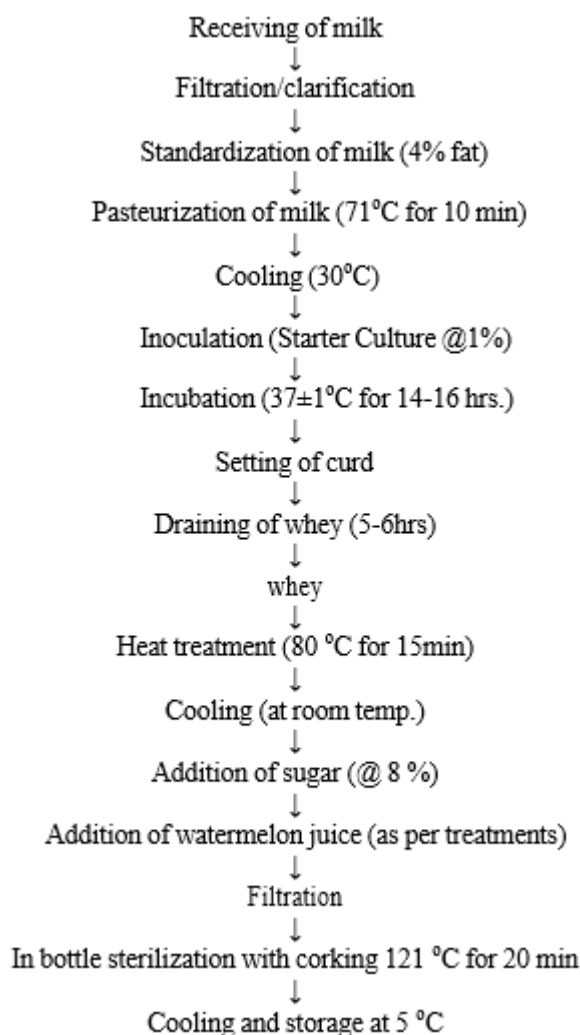


Fig 1: Flow chart for preparation of chakka whey beverage blended with watermelon juice.

The product was subjected to chemical analysis the fat (by Gerber's method, IS: 1224, Part 1, 1977) [9], total solids (by gravimetric, ISI:1981, part XI) [12], solids not fat (subtracting the percentage of fat from the percentage of total solids), acidity (IS: 1479, part I 1960) [11], protein (by macro-kjeldahl method, IS: 1479, part II, 1961) [10], ash (IS: 1167, 1967) [8], pH (by digital pH meter) and moisture was determined by subtracting the total solid content from 100 in the sample. The quality of chakka whey beverage was judged by offering the sample to the panel of 5 judges in each trial separately by score card method for sensory evaluation by using 9 point

hedonic scale suggested by Nelson and Trout (1964) [16]. The experiment was laid out in completely randomized design (CRD) with 4 treatments and 5 replications. The data obtained were analyzed statistically according to method described by Snedecor and Cochran (1994) [22].

Results and Discussion

A) Sensory evaluation of chakka whey beverage

The data with respect to sensory evaluation of chakka whey beverage are presented in Table 1.

Flavour

The score for flavour was increased upto treatment T3 i.e. 10 parts addition of watermelon juice, thereafter score was declined. The highest scores for flavour (8.27) was obtained in chakka whey beverage prepared with 10 parts of watermelon juice (T3), while lowest score (7.20) was obtained in chakka whey beverage prepared without addition of watermelon juice (T1). This finding is in tune with Punnaiarasi *et al.* (2017) [20] in watermelon juice (10%) chakka whey beverage.

Consistency

The mean scores for consistency attribute were highest (8.21) was obtained in chakka whey beverage prepared with addition of 10 parts watermelon juice (T3), while the lowest score (7.18) was obtained in chakka whey beverage prepared without addition of watermelon juice (T1). Similar results were reported by Nairu Bhasarkar (2010) [15] in orange pulp chakka whey beverage.

Colour and appearance

The highest colour and appearance scores (8.30) received by chakka whey beverage prepared with 10 parts of watermelon juice i.e. T3 treatment, while the lowest score (7.37) was recorded in chakka whey beverage prepared without addition of watermelon juice (T1). Similar results were reported by Meshram *et al.* (2019) [14] strawberry whey beverage.

Mouth feel

The significantly highest mouthfeel score was (8.38) received by chakka whey beverage prepared with 10 parts of watermelon juice i.e. under T3 treatment, while lowest score (7.01) was received chakka whey beverage prepared without addition of watermelon juice i.e. T1. The mouth feel of flavoured milk in treatment T3 was superior over rest of the treatments. This finding is in agreement with Ingale (2018) [7] in kiwi whey beverage.

Overall acceptability

The significantly highest overall acceptability score 8.38 was received by chakka whey beverage prepared with addition of 10 parts of watermelon juice i.e. T3 treatment which was superior to remaining treatment.

Table 1: Overall average sensory score of chakka whey beverage as affected by different levels of watermelon juice

Treatments	Flavour	Consistency	Colour and Appearance	Mouthfeel	Overall Acceptability
T1	7.20d	7.14d	7.37d	7.01d	7.16d
T2	7.61c	7.57c	7.68c	7.46c	7.54c
T3	8.27a	8.21a	8.30a	8.38a	8.38a
T4	8.01b	7.75b	7.93b	7.86b	7.91b
S.E.(m)	0.06	0.12	0.06	0.12	0.08
C.D.	0.19	0.38	0.19	0.37	0.25
Result	Sig	Sig	Sig	Sig	Sig

B) Physico-chemical analysis of chakka whey beverage

The chakka whey beverage were subjected for the proximate analysis viz., fat, total solids, SNF, acidity, protein, ash, pH and moisture. The results obtained on account of these parameter are presented in Table 2.

Fat content

The fat percentage was significantly highest in treatment T1 (0.48%) prepared without addition of watermelon juice and lowest fat content was noticed in T4 (0.38%) prepared with 15 parts of watermelon juice. It indicated that fat content in chakka whey beverage decreased with the increased watermelon juice level. Similar results were reported by Pushpalata Bende (2011) [17] in tomato pulp whey beverage.

Total solids content

The maximum total solids content (7.12%) was noticed in chakka whey beverage with 15 parts watermelon juice (T4), whereas the lowest (6.98%) was recorded in chakka whey beverage without watermelon juice (T1). Total solid content of chakka whey beverage increased with an increase in the level of watermelon juice. The finding is in agreement with Pandiyan *et al.* (2011) [21] in mango flavoured whey beverage.

SNF content

The highest SNF content (6.71%) was observed in chakka whey beverage with 15 parts watermelon juice (T4) and lowest (6.50%) in chakka whey beverage without addition of watermelon juice (T1). Solids not fat content of chakka whey beverage was gradually increased due to the addition of different levels watermelon juice. The finding is in agreement with Meshram *et al.* (2019) [14] in strawberry whey beverage.

Acidity content

The acidity percentage was significantly highest (0.50%) prepared with 15 parts of watermelon juice (T4) and lowest acidity content (0.42%) was noticed in chakka whey prepared without addition of watermelon juice (T1). It indicated that acidity content in chakka whey beverage increased with the increased watermelon juice level. Similar

result was reported by Gond (2015) [6] in sweet orange whey beverage.

Protein content

The highest protein content (0.52%) was observed in chakka whey beverage with 15 parts watermelon juice (T4) and lowest (0.41%) in chakka whey beverage without addition of watermelon juice (T1). Addition of watermelon juice increased the protein content of chakka whey beverage. Similar result was reported by Bhavsagar *et al.* (2010) [3] in pineapple whey beverage.

Ash content

Ash content of chakka whey beverage was increased due to the addition of different levels watermelon juice. The highest ash content in chakka whey beverage (0.52%) was observed in chakka whey beverage with 15 parts watermelon juice (T4) and lowest (0.42%) in chakka whey beverage without addition of watermelon juice (T1). This result in agreement with Dhumale (2016) [5] in channa whey beverage prepared with Nagpur mandarin juice (0.30 to 0.48%).

pH value

The pH value was significantly highest (5.58) in chakka whey beverage prepared without addition of watermelon juice (T1) and lowest pH value (4.78) was noticed in whey beverage prepared with 15 parts of watermelon juice (T4). It indicated that pH values in whey beerge decreased with the increased watermelon juice level. Ahmed *et al.* (2011) [1] reported that that the pH of whey based mango beverage was 4.86.

Moisture content

The maximum moisture content (93.02%) was noticed in chakka whey beverage prepared without addition of watermelon juice (T1), whereas the lowest (92.88%) was recorded in whey beverage with 15 parts of watermelon juice (T4). Similar results were also reported by Meshram *et al.* (2019) [14] in strawberry whey beverage.

Table 2: Overall average of physico-chemical attributes of flavoured milk as affected by different levels of ginger juice (pe cent).

Treatments	Fat	Total solids	SNF	Acidity	Protein	Ash	pH	Moisture
T1	0.48a	6.98d	6.50d	0.42d	0.41d	0.42d	5.58a	93.02a
T2	0.45b	7.03c	6.57c	0.45c	0.46c	0.46c	5.19b	92.97b
T3	0.41c	7.07b	6.66b	0.47b	0.49b	0.49b	4.96c	92.93c
T4	0.38d	7.12a	6.71a	0.50a	0.52a	0.52a	4.78d	92.88d
S.E. ±	0.008	0.010	0.014	0.005	0.006	0.006	0.049	0.010
C.D @ 5%	0.025	0.032	0.044	0.015	0.020	0.020	0.147	0.032
Results	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.

C) Cost of production

The cost of production of 1 lit. chakka whey beverage prepared with chakka whey and watermelon juice in proportion of 100:0(T1), 95:5(T2), 90:10(T3) and 85:15(T4) treatments were Rs.17.50, 19.90, 22.30 and 24.70 respectively. The cost of chakka whey beverage increases as the level of watermelon juice increases. However, the cost of production of chakka whey beverage prepared with 10 parts watermelon juice (T3) was found to be Rs. 22.30 per litre which is best treatment selected by judges by sensory evaluation. However the cost of production of custard apple (10%) whey beverage were reported by Khodake *et al.* (2017) [13] was more than present study (Rs. 38.00/lit).

Conclusion

Hence, it may be concluded that best quality chakka whey beverage can be prepared by addition of 10 parts of watermelon juice and 90 parts of chakka whey with 8.0% sugar.

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